CLAIMS

1. A method for diagnosing a predetermined condition in a subject, said method comprising the steps of:

(i) determining the amount, or relative amount, of a predetermined diagnostic species in a first breath sample;

(ii) determining the amount, or relative amount, of said predetermined diagnostic species in a second breath sample;

(iii) relating the results of steps (i) and (ii) with the presence or absence of said predetermined condition;

wherein said first sample and second sample are ex vivo and are derived from different phases of a breathing cycle of said subject.

2. A method according to claim 1 wherein the predetermined condition is a condition that has a discernible effect on the oxidative stress and/or lipid peroxidation in the subject.

3. A method according to claim 1 or claim 2 wherein the predetermined condition is one or more or a combination of: cancer, such as lung cancer; pulmonary disease; heart disease, chronic obstructive pulmonary disease, cardiovascular disease or peripheral vascular disease, ischaemia-reperfusion injury; Alzheimer's disease; attention deficit hyperactivity disorder; asthma; diabetes; immune and auto-immune diseases or disorders; post-organ-transplantation conditions; metabolic syndrome; stroke or other brain injury; liver disease; hyperlipidaemia; conditions resulting from hyperbaric or

hyperoxia treatment; inflammatory bowel disease; vitamin E deficiency, selenium deficiency and other nutritional diseases; malnutrition; pregnancy; pre-eclampsia; gastro-intestinal conditions; or genetic disorder leading to increases in oxidative stress and/or lipid peroxidation.

4. A method according to any one of claims 1 to 3 wherein the first and second samples correspond to shallow (or tidal) breath and deep (or alveolar) breath.

5. A method according to any of claims 1 to 4 wherein the diagnostic species is a species that is volatile at room temperature and pressure.

6. A method according to any one of claims 1 to 5 wherein steps (i) and (ii) are carried out using a measurement apparatus arranged to detect the absorption of electromagnetic radiation at and around a known absorption wavelength for the diagnostic species.

7. Use of a measurement apparatus to determine the amount, or relative amount, of a predetermined species in a first breath sample obtained from a subject and to determine the amount, or relative amount, of said predetermined species in a second breath sample obtained from the subject, wherein said first sample and second sample are derived from different phases of a breathing cycle of said subject.

8. A use according to claim 7 wherein the measurement apparatus has a laser source with tuneable wavelength.

9. A use according to claim 8 wherein the measurement

apparatus has phase-sensitive detection means to detect intensity fluctuations of the electromagnetic radiation from the laser source.

10. A collection apparatus for collecting samples of breath from a subject from different phases of a breathing cycle of the subject, the apparatus having:

an inlet conduit for conveying the subject's breath;

a first collection chamber for storing a sample of breath from a first phase of the breathing cycle; and

a second collection chamber for storing a sample of breath from a second phase of the breathing cycle,

wherein first sealable means is operable to provide a flow path from the inlet conduit to the first collection chamber and subsequently to seal the first collection chamber and second sealable means is operable to provide a flow path from the inlet conduit to the second collection chamber and subsequently to seal the second collection chamber.

11. A collection apparatus according to claim 10 wherein the first and second sealable means allow flow of breath sample substantially in one direction only.

12. A collection apparatus according to claim 10 or claim 11 wherein the first and second collection chambers have flexible walls, allowing variation of the internal volume of the chambers so that the chambers can be flattened when not in use.

13. A collection apparatus according to any one of claims 10 to 12 wherein a disposable mouthpiece is

provided for connection to the inlet conduit.

14. A collection apparatus according to any one of claims 10 to 13 wherein an intermediate conduit is provided between the first collection chamber and the second collection chamber and the first sealable means is located along the intermediate conduit.

15. A collection apparatus according to claim 14 wherein the first collection chamber is inflatable to filled volume at lower pressures than the second collection chamber and the second collection chamber is inflatable by subsequent breath at a higher pressure.

16. A collection apparatus according to any one of claims 10 to 13 wherein the inlet conduit has at least two branch conduits, the first branch conduit leading to the first collection chamber via the first sealing means and the second branch conduit leading to the second collection chamber via the second sealing means.

17. A collection apparatus according to claim 16 wherein the second sealing means is caused to open when the first sealing means seals, allowing subsequent breath to be collected in the second collection chamber.

18. A collection apparatus according to claim 16 or claim 17 wherein the branch conduits present different flow impedances to gas flow along them, so that the collection bag connected to the lowest-impedance branch conduit fills first.

19. A collection apparatus according to any one of

claims 10 to 18 wherein the apparatus is arranged so that breath from an early phase of the breathing cycle is collected in the first collection chamber before sealing of the first sealable means and then breath from a subsequent phase of the breathing cycle is collected in the second collection chamber.

20. A collection apparatus according to any one of claims 10 to 19 having one or more further collection chambers, arranged so that breath from an early phase of the breathing cycle is collected in the first collection chamber and then breath from a subsequent phase of the breathing cycle is collected in the second collection chamber and then breath from one or more subsequent phases of the breathing cycle is collected in said one or more further collection chambers.

21. Use of a collection apparatus according to any one of claims 10 to 20 to collect two breath samples from a subject, each sample corresponding to a different phase of a breathing cycle, including the steps:

conveying the subject's breath along the inlet conduit and into the first collection chamber via the first sealable means;

sealing the first sealable means;

conveying the subject's breath along the inlet conduit and into the second collection chamber via the second sealable means; and

sealing the second sealable means.

22. A breath test kit for collecting and assessing samples of breath derived from different phases of a breathing cycle of a subject including a collection

apparatus according to any one of claims 10 to 20 and a measurement apparatus arranged to determine the amount, or relative amount, of a predetermined species in a first breath sample from the subject and to determine the amount, or relative amount, of said predetermined species in a second breath sample from the subject.